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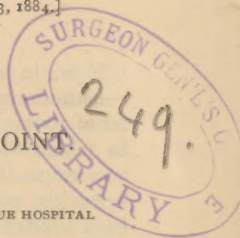
J. C. Miller

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ON DISEASE OF THE KNEE-JOINT.

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BY LEWIS A. SAYRE, M.D.,

PROFESSOR OF ORTHOPEDIC SURGERY IN THE BELLEVUE HOSPITAL
MEDICAL COLLEGE, NEW YORK.



GENTLEMEN: This morning I desire to call your attention to disease of the knee-joint. There are, in all, fourteen ligaments connected with this joint—your Professor of Anatomy having doubtless demonstrated the same to you. The bony structures assisting in the formation of the joint are the femur, tibia, and ~~fibula~~, together with the patella—the whole being lined by a synovial membrane.

We shall first take up synovitis. This can be caused by constitutional affections alone, as gonorrhœa, rheumatism, etc.; or it may be induced locally by a blow, wrench, or cold. If it is acute, and the joint filled with fluid, and the patella elevated, giving fluctuation, by percussion you can get a click of this bone upon the femur, as a rule. If, however, the effusion is not very great, you will fail to get this click; but you will be enabled to detect the peculiar fluctuating feeling upon either side of the patella. You will remember that under the patella there is a bursa, and another under the tendon of the quadriceps muscle above the patella, and yet another ~~external to~~ the patella. These I specially call your attention to, as they are of vast importance and significance: for you may mistake a disease of these bursæ for disease of the knee-joint itself. Between the bursæ and the knee-joint we find quite a mass of fat. It is, however, well to remember that disease of these bursæ may also involve the knee-joint,

Ligamentum

in front of or over

Now, in synovitis of the knee-joint resulting from constitutional causes, if it be from rheumatism, as a matter of course you diagnosticate the case from the manner in which the pain changes from place to place. But you must also think that, perhaps, in addition to the synovitis, you may have an osteitis, this being caused by a sudden wrench, strain, or concussion; more generally the concussion will cause an extravasation of blood into the cancellous tissue lying just beneath the encrusting cartilage of the femur or tibia, or into the patella. This injury may appear but slight at the time, and cause the patient no great pain, and even if examined by a medical man may not be correctly diagnosed. But if this apparently slight injury be not correctly diagnosed, and the proper treatment be neglected, it will in time lead on to serious disintegration of the bone substance; a low grade of inflammation being set up, and pus formed, which slowly burrows into the joint, the encrusting cartilage becoming involved, leads on to necrosis; ulceration of the cartilage taking place because of its low grade of vitality, and soon the true bony structures come into contact, being denuded of their cartilage by the disease; there appearing at the same time a fungous exudation from the synovial membrane lining the joint, and which hence becomes rough and granular, the membrane being changed from its smooth, shining surface, and we have what is called gelatiniform degeneration of the joint.

This condition, which I have endeavored to explain to you, is simply the result of long-continued inflammatory action, and, as a rule, from some *slight* accident. If the injury caused acute inflammation at the time, it would have been noticed at once, and appropriate treatment applied. But in those slight injuries which pass unnoticed at the time, and months elapse before the real symptoms set in, this slight injury, occurring long before, is overlooked or forgotten, and the disease is pronounced then

to be white swelling, there being no redness about the joint. And yet, for the reason that there is so much constitutional disturbance accompanying this swelling, the disease has been almost universally looked upon as of constitutional origin; whereas, in the great majority of cases, it is the result of a direct injury to the parts diseased; and the long-continued action, together with the slow inflammation, is what has produced this constitutional disturbance, and leads the physician into the belief that the disease is dependent upon some constitutional dyscrasia alone. There is no doubt that a constitutional dyscrasia *may* be inherited from the parents; you can also create a disease by bad hygiene, which, sooner or later, may bring about a strumous condition; and when you have reached this condition, no matter whether inherited or acquired, a very slight injury will start degenerative action very rapidly; much more rapidly than if the health of the patient were in a normal condition—as in the normal condition the system has more recuperative and resisting power than when diseased.

Now, I do not wish you to misunderstand me on this point; but I will distinctly state that in persons laboring under this strumous diathesis, whether inherited or acquired, some local effect is necessary to start the disease. In constitutional diseases, they are diseased all over; then why should the disease manifest itself at one particular point more than another? Simply because it is a traumatism that has produced this external manifestation of the disease at this point.

The tendency of this inflammatory action is to produce an effusion into the joint, which causes a certain and characteristic distortion of the joint. Thus, in disease of the knee-joint, we find the limb partially flexed at the knee, because by this flexion of the limb the capsular ligament becomes relaxed, and the joint-cavity can then contain more fluid, and thus relieve the dis-

eased parts from pressure. The same explanation is equally applicable to disease of the hip-joint; the limb is flexed in order to distend the joint capsule and accommodate the increasing effusion. In the course of time the muscles themselves begin to contract, owing to reflex irritability, and these in turn draw the diseased surfaces of the bone together, and thus diminish the amount of blood to the parts pressed upon, and therefore interferes with the nutrition of these parts, resulting in severe and extensive ulceration from this lack of vitality of the part. You can, then, readily understand how this pressure adds to the torture of the patient, besides inducing a more rapid disintegration of the parts pressed upon.

In the knee-joint, then, we have this flexion and out-rotation of the leg, the biceps muscle constantly acting upon one point only, keeps up this continued pressure upon the outer condyle of the femur. For this reason the leg is rotated outward. On the inner side of the leg we have the insertion of the sartorius, semi-tendinosus, semi-membranosus, and gracilis muscles, which act against the biceps alone on the external surface of the leg; these four muscles having different points of insertion, do not maintain their traction at one particular point; there is no continued pressure upon the articular surfaces at one point at all times; thus the inflammatory action is more tardy at the internal aspect of the joint; whereas the biceps, acting upon one point alone, allows of no relief from pressure, and thus does more damage than the other four muscles combined. This is the reason of the peculiar deformity accompanying disease of the knee-joint.

If, in connection with this diseased condition of the joint, you have constitutional disturbance—torpor of the bowels, or affection of the kidneys, etc.—it is necessary to give this condition the requisite treatment; but do not pin your faith to any so-called specifics, for there is

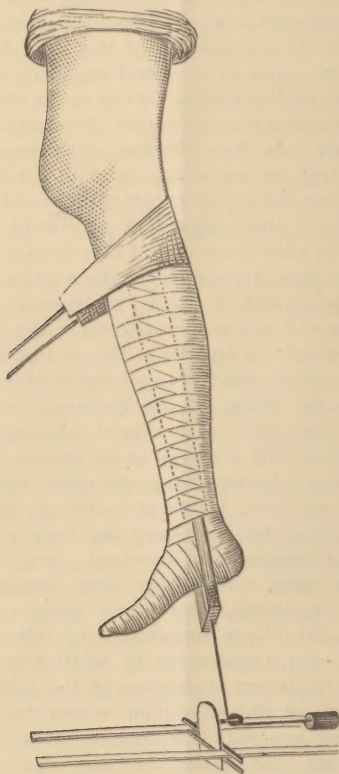
no remedy on the face of the earth which will take the place of fresh air and good nourishing diet in this class of cases. The local treatment, however, is of the most vital importance, and if you omit that, your patient will never recover with a good and useful joint. The general treatment, independent of the local treatment, is not sufficient. You must, therefore, apply some means to overcome that distortion, by the use of traction in the required direction to correct that deformity and relieve that pressure. In these diseases of the knee-joint, you will find your patient sitting, holding his leg, until he becomes worn out by the constant effort of keeping it in one position, in order to prevent attrition of the diseased surfaces. In your treatment of this disease, if you simply lock the knee up, you will make a failure; you must have *extension* with it, or the contracted condition of the muscles will add to the progress of the disease. In contradiction of the statement I have just made, I will quote from the twentieth annual report of the New York Society for the Relief of the Ruptured and Crippled. "Weights and pulleys to extend diseased limbs are never used in this hospital, as we believe them to be mere palliatives in treatment, and often injurious."

There is no need for me to make any lengthy comment on such a statement, and the results arising from this plan of treatment in diseased joints, as the large number of cases which have been presented at our clinics for treatment, after being under treatment for months at the above hospital, have fully proved the fallacy of such a statement in relation to the proper method of treatment of diseases of the joints.

In disease of the knee-joint where the leg has become flexed, you will first require extension made in two directions, one upward and the other parallel with the long axis of the limb (see Fig. 1). If I attempt to straighten a limb in this position by parallel extension only, I simply add to the pain; but by securing the

limb with extension in the *two* directions, namely, in the line of the deformity, I afford instant relief. If you

FIG. 1.



can place the parts in such a position as to afford relief, that is all there is for you to do ; but you must carry

out that plan. Sometimes it may be necessary to apply heat or cold. You may think that somewhat strange, but it is a fact; neither can I tell you which to apply, or when to apply it; you have to judge by the feelings of the patient, and apply that which affords most relief. In one case you may apply ice with great effect; if this, however, causes pain, relief may be derived from heat in all probability. Now, if there is but very little swelling in the joint, but intense pain over the coronary ligaments, then you can apply the hot iron over these ligaments and allow the wound to cicatrize; but under no circumstances get up a suppurating sore. You may, perhaps, need to apply a blister, and when the blister is raised, just let out the exudate, but do not take off the skin or you will be liable to have a suppurating sore also. After letting out the fluid, you cover the part with a piece of oiled rag. This is the only proper way to apply blisters; the actual cautery, however, you will find most efficient in these cases.

After you have, by means of your traction, brought the leg almost straight, you can then apply the knee-splint, which I here show you (see Fig. 2). In preparing the limb for the application of this instrument, cleanse it thoroughly in order to remove all particles of exudate which would prevent the adhesion of the plaster, which I now intend to show you how to apply. In the application of any kind of splint in which adhesive plaster is used, I prefer to use Maws's or Shivers's moleskin plaster, which I here show you, and which can be procured from Messrs. Hunt & Dunlap, 1218 Broadway. In applying this knee-extension splint, I cut inch-strips of plaster, as you now see, which are long enough to pass from just above the knee to the upper third of the thigh, and allow sufficient to reverse over the collar of the splint. I now pass more strips from just below the knee to a little above the ankle, and in like manner allow of reversing over the bottom collar of the instrument. We

now have the plasters adjusted, leaving the knee exposed (see Fig. 3).¹ My assistant now holding the limb

FIG. 2.

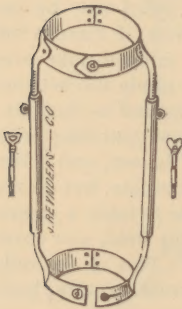
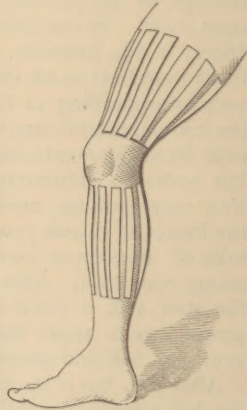


FIG. 3.



and plasters in position, I take a roller-bandage and bind very firmly around the limb, and then, with my hand, by rubbing, I firmly secure the plaster to the skin; and now, as I remove this tight bandage, you see they remain in their place without my assistant holding them, and he is at liberty to assist me in other ways.

I now take a roller-bandage, and place permanently around the leg, to retain the plasters in position; then I secure those upon the thigh in the same manner, still leaving the knee exposed, you will observe. I am now ready to apply the splint. First, I secure the lower collar—by means of the key I regulate the size as may be required, to prevent strangulation of the circulation;

¹ The strips of plaster on both thigh and leg should be longer than they are represented in this cut.

then, reversing the ends of the adhesive plaster over the collar of the instrument, you notice I secure them in that position by passing a strip of adhesive plaster around the leg directly over the collar of the instrument. Having thus secured them, I now continue with my roller-bandage over the collar of the instrument and under the extension-rods around the leg, and over the reversed ends of the adhesive plaster. In this manner we have secured the lower part of the splint, and will now turn our attention to the upper part of the same. I desire specially to call your attention to this collar, inasmuch as it allows of motion upon the rods of the splint; whereas, in the lower collar of the instrument, you noticed that it was perfectly immovable and could not possibly be moved upon the rods, as in this upper collar. If, now, both of these collars were movable, you could not retain the leg in any one position, for the simple reason that the collars would tilt upon themselves, and thus, while the upper edge of the lower collar and the lower edge of the upper collar would press in upon the leg and cause excoriations, your extension would be lost and the joint surfaces brought together, and the disease within the joint, instead of diminishing, would increase. I mention this the more especially as it is but a few weeks ago that a child was brought to my office wearing an extension knee-splint, in which both collars were movable, and which was made by Tiemann & Co. The physician who brought the child to me came from Canada; he told me that he wrote for my splint, and received such a one in return. Now, I wish to be distinctly understood upon this point, and cannot impress upon you too strongly the necessity of one collar being firmly fixed and immovable upon the extension-rods, for it is only those that I use; the other, in which the two collars are movable, is perfectly useless, and is not my splint. The same thing has occurred to me in the splint made by Shepard & Dudley. The splint which I

here show you is made for me by Reynders & Co., 303 Fourth avenue.

Having now secured both upper and lower collars in a similar manner, still leaving the knee exposed (see Fig. 4), I now take my key and make the requisite extension, which will be when my patient tells me he is free from pain. You will notice that, while doing this, my hand is under the upper third of the leg, pressing upwards. This is to prevent the anterior surfaces of the joint from being brought together while I am making extension. Having now secured the requi-

FIG. 4.

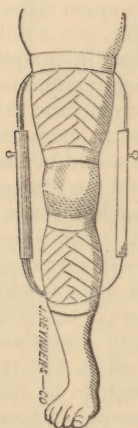


FIG. 5.

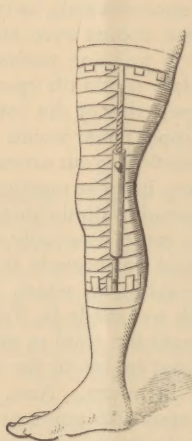
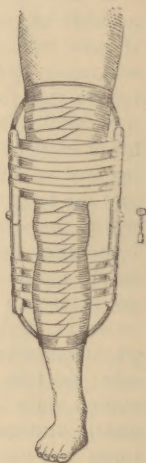


FIG. 6.



site extension, and the patient being free from all pain, we shall endeavor to secure the absorption of the effusion around the joint, and for this purpose I now take some strips of adhesive plaster about an inch wide, and bind

them firmly around the joint, leaving no place uncovered; by this means I secure an equal pressure all over the joint surface. Having accomplished this, I now pass a roller-bandage around the joint over the plaster, and thus retain them in position (see Fig. 5). Anyone looking at that leg now, would perhaps suppose that was the end of the dressing; and I regret to say that I have seen some students who manifested so little interest in the pursuit of their studies, and although, perhaps, wishing to see the instrument applied, would rush from the lecture-room because it was almost the close of the hour, and think they had seen enough to warrant them to apply the instrument if they should ever be called upon to do so; whereas, by this very thoughtlessness and carelessness, they lost one of the most important points in the application of this knee-extension splint; and perhaps by this very carelessness, when an opportunity offered, would ruin both their own reputation and the leg of the patient. I therefore desire you specially to observe this last and final application of the bandage, and make careful notes of the manner in which I apply it. You will notice that, having now bandaged the knee, I carry my roller up the thigh, passing it over the thigh in front and under the rods of the instrument, bringing it in front of the thigh only—not behind at all. By this means I press the femur back and assist in straightening the limb. Having done this, I now pass my roller down below the knee, but instead of passing it in front of the leg, as I did with the thigh, I pass it behind the leg and over the front of the rods of the splint, thus forming a cradle for the leg and still further straightening the limb. This last bandage, you will notice, takes the place of my hand, which I just now drew your attention to, as pushing the tibia forward to prevent any pressure upon the anterior surface of the joint (see Fig. 6).

You have now seen the complete application of the

extension splint in disease of the knee-joint. But, supposing that your patient is very heavy, I should advise the use of a pair of crutches in addition, as the weight of the patient may cause the adhesive plaster to slip, and thus necessitate constant reapplication of the splint. If, however, it is a child, there will in all probability be no need for the use of the crutches, and it can run about with the splint as you have just seen it applied.

Case I.—This boy, whom I now present to you, was brought to me some time since suffering from disease of the knee-joint. He was then nine years of age, and out of a family of nine children the only one who is in any way failing in health. He was strong and healthy until he was four years old, when, I am informed by his mother, he was supposed to have had some trouble with his kidneys, and shortly after he was attacked with otitis of both ears, ending in perforation of the drum, with more or less discharge up to the present time. You have all observed that, in addressing him, he is compelled to use an ear-trumpet.

Some four years ago a swelling was observed upon the inside of the right knee after exercising. He was taken to a distinguished surgeon of Philadelphia, who, the mother stated, advised massage and gentle motion. Failing to get relief under the treatment, and the swelling still increasing, another eminent surgeon was then consulted, he giving his opinion that it was white swelling, and advised a course of constitutional treatment with the external application of iodine, no mechanical treatment at that time being advised. The leg becoming flexed, the attending surgeon afterwards ordered an instrument for the purpose of bringing the leg straight; but the *main feature* required was lacking in the instrument, there being *no extension* made with the endeavor to straighten the limb. No relief being obtained by the constitutional treatment, or the mechanical appliance, after two years of this method of treatment, and the dis-

ease still increasing, the attending surgeon then advised amputation of the limb. Before consenting to this, however, the father decided to bring the boy to me. At the time that I saw him the knee had lost all its contour; there was a large abscess over the joint, fluctuation extending two-thirds up the thigh. On the inside of the inner condyle was a sinus, into which a probe could be passed through the joint, emerging at the upper portion of the tibia. The leg was flexed at an angle of forty-five degrees, and the least motion caused intense pain. The measurement being taken over the patella, gave eleven inches against eight and a half inches around the sound limb; below the patella, the diseased limb measured ten and one-eighth inches against eight inches below the patella of the sound limb, the muscles of the calf of the diseased limb being greatly reduced in size, owing to disuse. Upon making traction upon the leg in the line of the deformity, *e. g.*, in the two directions, as is my usual custom in disease of the knee-joint when the limb has become greatly flexed (see Fig. 1), immediate relief was obtained. I therefore determined to delay amputation until he had had the advantage of my plan of treatment, and at once ordered him to be placed in bed and extension made in the two directions, previously making a free opening into the joint, passing a rubber drainage-tube through the knee from the inner condyle to the outer portion of the tibia, and another one from above the knee and aspirating the abscess at the thigh; these operations being performed antiseptically, the joint being tightly strapped and the limb carefully bandaged. The extension was maintained for six weeks, until the limb had been brought sufficiently straight, so that the extension knee-splint could be applied in the manner already described. This has been reapplied from time to time, as occasion has required, and extension made within the

limits of prudence, until, as you see, the leg has been brought almost straight.

He comes to me now able to walk upon the leg without pain or discomfort, the sinuses having since closed. The result is much better than I could dare anticipate; but I am in hopes of securing still better results, as I shall presently show you.

I refused to operate when he was brought to me, as he was in such a miserable condition that there seemed very little hope for his life if amputation were performed. I thought then it would be an excellent recovery if he could be cured with ankylosis. I now find the patella quite firmly attached, but by using a little force I can secure slight movement, although it causes considerable pain. Now, by bearing down upon the leg, I can bring the limb almost to a straight line, and having secured such a condition of things, I feel inclined to do more than to let him go with the limb in its present position. I certainly see no reason why it should not terminate in a movable joint.

You see that I move the tibia on the femur easily enough, but the patella does not move at all. If I can succeed in loosening the patella, I am quite certain that something can be done by developing the quadriceps muscle. This is a lesson of practical value, and I hope you will see the importance of the continuance of further treatment; although, in this case now before you, we have a most satisfactory and remarkable recovery. I have ordered an instrument to be made by which the leg will be thrown forward. The principle is to carry your treatment up to the point of endurance, but not to a point of exciting fresh inflammatory action. Remember, that if by your passive movements and massage you create heat and pain in the joint, and they have not disappeared on the following day, then you have carried it to excess, and should, therefore, give the joint perfect

rest, with the application of cold water, until all inflammatory action has passed away.

Now, I desire you to understand the importance of motion and massage at the proper time. During the active progress of the disease, *rest, rest, rest*, is the essential element of the treatment, and at the same time extension sufficient to prevent pressure of the diseased surfaces against each other, induced by reflex muscular contraction. But when the inflammation has subsided, and all morbid action has disappeared, then passive motion may be instituted for the purpose of preventing ankylosis.

If you understand the principles of this, you will have no difficulty in these cases of ankylosis; and remember that you have no right to stop until you have secured all that is attainable.

Note (nine months after).—There is now excellent motion in the joint, the patient being able voluntarily to extend the leg to almost a straight line; and can flex the knee to a right angle. He can now run around with ease, and this winter has skated with his companions.

Case II.—This man, aged forty-two years, comes here from Nebraska suffering from what is sometimes called hydrarthrosis. You will notice how immensely this left knee-joint is swollen. Upon taking the measurements we find its circumference to be: Above the patella, twenty inches; at the upper edge of the patella, twenty-one and one-half inches; at the lower edge of the patella, eighteen and one-quarter inches. The measurements of the knee of the sound leg are: Above the patella, thirteen and three-quarters inches; at the upper edge of the patella, thirteen and one-half inches; at the lower edge of the patella, thirteen inches. You observe that he can flex the leg perfectly and extend it almost to a straight position, and can also walk upon it. He states that he has been to the Hot Springs, and to one of the hospitals in St. Louis, and has had numberless

applications to the knee, but to no avail. He had the knee aspirated twice in St. Louis, a quart of fluid being removed on each occasion, he states ; this, however, I think is doubtful.

He tells me that previous to this difficulty, while carrying a pail out with feed for his hogs, he slipped and fell, striking the side of the knee violently, since which time the knee has gradually assumed its present proportions. The difficulty in this case is that while able to walk upon the limb, he can never be sure of it supporting him, as without a moment's warning it gives way and throws him to the ground.

On examination I find that the external condyle has been fractured off, and as you here see, I can take the whole piece in my fingers and slide it up and down as I wish ; while if I take hold of the internal condyle and attempt to make motion, I move the whole thigh. We have, therefore, an ununited fracture of the external condyle with this enormous swelling of the joint. Now what can we do here ? The only way is to have some artificial support for the limb, to prevent the man from having these sudden falls. This support must be designed to keep the leg in position, so that when the weight of the body is brought upon the leg it cannot be thrown off its point of bearing. Mechanical means is the only treatment which can be of advantage in these cases.